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PENSOFT

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Taxonomic notes on *Barinas*: a new generic synonym, a new cave-dwelling species, and new records from Colombia (Arachnida, Opiliones, Agoristenidae)

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Abstract

Barinas guanenta **sp. nov.** is described from a cave in Santander, central Andes of Colombia. The new species is recognized by the pedipalps and chelicerae entirely pale yellow and without variegated pattern, the areas I-IV with variegated coloration pattern and the straight stylus of the penis. The monotypic genus *Vimina* González-Sponga, 1987 is synonymized with *Barinas*, resulting in *Barinas virginis* (González-Sponga, 1987) **comb. nov.** New records of *Barinas piragua* Ahumada-C. & García, 2020 in La Guajira, Northern Colombia, are given. A key for the species of *Barinas* is given together with an updated distribution map.

Key Words

biodiversity, harvestmen, Leiosteninae, taxonomy, *Vimina*

Introduction

The taxonomy of the Neotropical subfamily Leiosteninae Šilhavý, 1973 (12 gen., 59 spp.), widespread in northern South America, has recently aroused the interest of some researchers, resulting in several papers focused on nomenclatural acts (Ahumada-C. et al. 2020; García and Kury 2020; García and Villarreal 2020; García and Pastrana-M. 2021; Villarreal et al. 2021), and/or approaches to the systematics of the group (Villarreal and García 2021).

To continue on this path, the present work brings taxonomical novelties of the genus *Barinas* González-Sponga, 1987, that currently groups two species: the type species, *Barinas flava* González-Sponga, 1987 (from the Andean slopes of Venezuela), and *Barinas piragua* Ahumada-C. & García, 2020 (from the Caribbean region of Colombia), both characterized by the paired armature in the scutal areas I-IV and the stylus of penis dorsally curved (Ahumada-C. et al. 2020).

After the revision of harvestmen material from Colombia and Venezuela, we noted that the monotypic genus *Vimina* González-Sponga, 1987, whose type species was described from a locality near to that of *B. flava*, should be synonymized with *Barinas*. Besides that, a new cave-dwelling species from the Andean region of Colombia was found. So, a new diagnosis for *Barinas*, a generic synonym with its subsequent new combination, the description of the new Colombian species, and new records for *B. piragua* are proposed.

Materials and methods

Individuals were photographed using a Leica M205C stereoscope attached to a Leica DFC450 digital camera. The

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resultant images were posteriorly edited in Photoshop CC 2014 software. Drawings were made using the software Inkscape 0.91. Descriptions of colors use the standard names of the 267 Color Centroids of the NBS/IBCC Color System as named in Centore (2016). The distribution map was made with Quantum GIS 3.12.3 Bucarest software (QGIS Development Team 2020). Colored shapes refer to WWF Terrestrial Eco-regions of the World (Olson et al. 2001).

Patterns of description and AHF (armature height formula, height differences between the armature on the mesotergal areas, where roman numerals represent the corresponding mesotergal area) follow Ahumada-C. et al. (2020). The terminology for dorsal scutum outline types follows Kury and Medrano (2016), with the modifications explained in Villarreal and García (2021), and for chaetotaxy of penis lamina parva and truncus follows Kury and Villarreal (2015).

Morphology abbreviations are **AL**—maximum abdominal scutum length, **AW**—maximum dorsal scutum width, **ChL**—chelicera length, **CL**—carapace length, **CW**—maximum carapace width, **DH**—dorsal hump, **DP**—dorsal process, **DS**—dorsal scutum, **DSL**—dorsal scutum length, **Fe**—femur, **IOD**—interocular distance, **LP**—lamina parva, **MS**—macrosetae of the penis, **Mt**—metatarsus, **Pa**—patella, **Ta**—tarsus, **Ti**—tibia, **TL**—total length, **Tr**—trochanter. All measurements are in mm unless otherwise noted.

The specimens are deposited in the following institutions: **CBUDC**—Colección de Ejemplares Biológicos de la Universidad de Cartagena (Cartagena de Indias, Colombia); **ICN**—Instituto de Ciencias Naturales de la Universidad Nacional de Colombia (Bogotá, Colombia); **MAGS**—Manuel Angel González Sponga collection (donated to MIZA collection); **MCNC**—Fundación Museo de Ciencias Naturales de Caracas (Caracas, Venezuela); **MIZA**—Museo del Instituto de Zoología Agrícola (Maracay, Venezuela); **MNRJ**—Museu Nacional da Universidade Federal do Rio de Janeiro (Rio de Janeiro, Brazil). The material destroyed by the fire in September 2018 is marked with an asterisk (*).

Results

Taxonomy

Order Opiliones Sundevall, 1833
Family Agoristenidae Šilhavý, 1973
Subfamily Leiosteninae Šilhavý, 1973

Genus *Barinas* González-Sponga, 1987

Barinas González-Sponga 1987: 453; Kury 1997: 344; 2003: 30; Ahumada-C. et al. 2020: 633.
Vimina González-Sponga 1987: 547; Kury 1997: 344; Kury 2003: 34. New synonym

Type species. *Barinas flava* González-Sponga, 1987, by original designation.

Emended diagnosis. DS Epsilon type 1. Ocularium low, smooth, or with paired high spines (*Barinas piragua*). Mesotergal areas I–IV with paired paramedian spines (AHF: I < II = III = IV in *B. flava*, I = II < IV < III in *B. piragua*, II = I<III = IV in *B. virginis* comb. nov., and I = IV < II = III in *B. guanenta* sp. nov.). Posterior margin, free tergites, and anal operculum armed (with tubercles in *B. flava*, *B. virginis* comb. nov. and *B. guanenta* sp. nov.; with spines in *B. piragua*). Pedipalps concolor with the body (*B. flava* and *B. virginis* comb. nov.; lighter than the body in *B. piragua* and *B. guanenta* sp. nov.). Coxae I–IV with one anterolateral tubercle dorsally projected. Fe IV length/DSL ratio: less than three in *B. virginis* comb. nov (1.93) and *B. flava* (2.58); more than three in *B. piragua* (3.4) and *B. guanenta* sp. nov. (3.38). Lamina parva crescent-shaped (in *B. flava* seems heart-shaped) and with very short corners that do not exceed the insertion point of the MS-A2. Malleus with two pairs of trifid MS-A, one pair of trifid MS-B, two pairs of MS-D, one pair of large and trifid MS-E2, and one pair of MS-E1 (in *B. piragua* short an conical, in *B. guanenta* medium-sized and elongated; unknown in *B. flava* and *B. virginis* comb. nov.). Stylus elongated, curved dorsally at distal portion (straight in *B. guanenta* sp. nov.), smooth (in *B. flava* and *B. virginis* comb. nov.; with a dorsal hump close to the union of the DP with the stylus in *B. piragua* and *B. guanenta* sp. nov.), and with a sharp proximal DP (blunt in *B. virginis* comb. nov.).

Included species. *Barinas flava* González-Sponga, 1987, *Barinas guanenta* sp. nov., *Barinas piragua* Ahumada-C. & García, 2020, *Barinas virginis* (González-Sponga, 1987) comb. nov.

Remarks. An emended diagnosis comparing *Barinas* with the remaining genera of Leiosteninae was offered by Ahumada-C. et al. (2020) and we decided not to repeat such information here. However, we want to emphasize that the presence of paired armature on mesotergal areas plus the basal DP of the stylus and the LP with very short corners not exceeding the insertion point of the MS-A2 are characters exclusive of *Barinas*.

Key to the species of *Barinas* (males)

1 Ocularium with paired spines; tarsus and claw of pedipalp of different coloration than the other pedipalpal segments. ..... *B. piragua*
– Ocularium smooth; all segments of pedipalp of the same coloration 2
2 Paramedian armature of mesotergal area IV of the same size as that of area III; stylus curved distally 3
– Paramedian armature of mesotergal area IV smaller than that of area III; stylus straight ..... *B. guanenta* sp. nov.

3 Paramedian armature of mesotergal area II smaller than that of area III; dorsal connective tissue between the stylus and the dorsal process present (Fig. 3C, D, F) ..... *B. virginis* comb. nov.
– Paramedian armature of mesotergal area II same size as that of area III; dorsal connective tissue between the stylus and the dorsal process absent (figs 1D-F in Ahumada-C. et al. 2020) ..... *B. flava*

Barinas guanenta sp. nov.

http://zoobank.org/CC2CB362-F997-4921-9480-1567A07C568E

Figs 1, 2, 4

Type material. Colombia• ♂ holotype: Santander, Cabrera, Cueva del Indio de Doña Joaquina; [6.562261; – 73.237897]; [1100 m]; 14 July 2007; Ca-vita grupo de bioespeleologia leg.; ICN-Ao-742.1 • 1 ♂ 1 ♀ paratypes; same data as the holotype; ICN-Ao-742.

Etymology. Guanentá was the leader of the Guanes, an indigenous group that fought bravely against the Spanish conquerors in the region where the species was collected. Noun in apposition.

Diagnosis. Can be distinguished by having pedipalps entirely pale yellow without variegated pattern (in *B. piragua* distal portion of Tr and Fe black, and tarsi entirely black; in *B. virginis* comb. nov. with a variegated pattern on Fe-Ti); variegated coloration on areas I-IV (*B. flava* and *B. piragua* without variegated coloration); stylus of penis straight (in all other *Barinas* species the stylus is curved at apical portion) (Figs 1, 2).

Description. (Figs 1, 2). **Male holotype** (ICN-Ao-742.1) measurements (mm): CL (0.57), AL (1.22), CW (1.20), AW (1.44), DSL (1.79), IOD (0.27), ChL (0.86). Pedipalp: Tr (0.35), Fe (0.48), Pa (0.34), Ti (0.57), Ta (0.44), Claw (0.42). Legs I-IV (Tr/Fe/Pa/Ti/Mt/Ta/TL): I (0.21/2.45/0.43/1.93/3.69/1.24/9.95), II (0.27/6.19/0.65/5.38/7.30/3.57/23.36), III (0.34/4.02/0.75/2.47/4.85/1.29/13.72), IV (0.37/6.11/0.71/3.57/6.80/1.79/19.35) . ***Dorsum:*** DS outline Epsilon type 2 (Figs 1A, B, 2A). Cheliceral sockets narrow, separated by medial projection (Fig. 2A). Anterior margin of DS smooth. Ocularium high (Figs 1D, E, 2B). Carapace smooth. Mesotergum delimited, divided into four areas (area I divided into two halves), with a transverse row of granules on each (Figs 1B, D, 2A, B). Areas I–IV with two paramedian spines, AHF: I = IV < II = III (Figs 1D, E, 2B); paramedian spines of areas III and IV projected backward

Figure 1. Photographs of *Barinas guanenta* sp. nov. (ICN-Ao-742.1), male holotype. Habitus in panoramic (**A**), dorsal (**B**), ventral (**C**), lateral (**D**), and frontal (**E**) views. Scale bars: 3 mm (**A**); 1 mm (**C, D**); 0.5 mm (**B, E**).

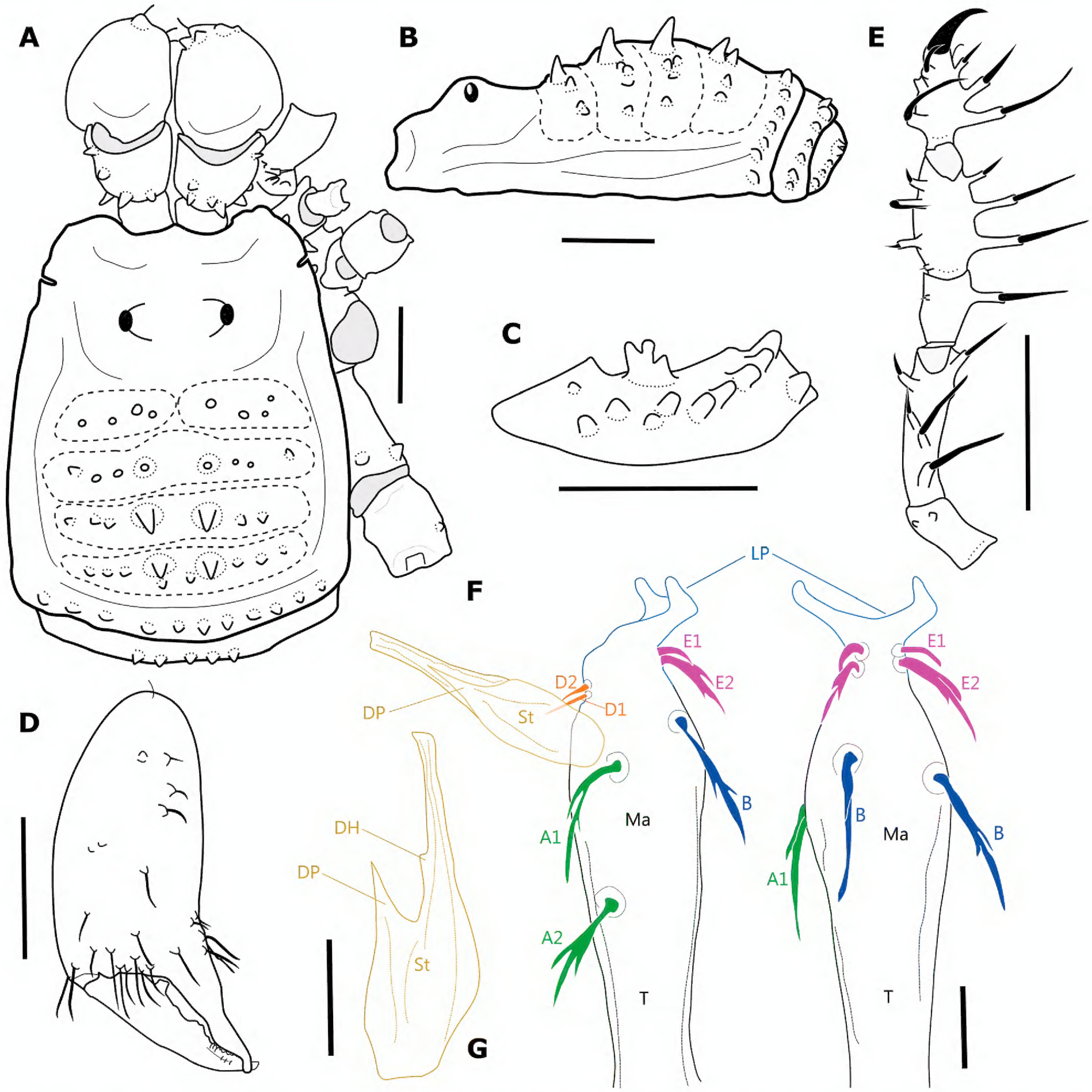

Figure 2. Drawings of *Barinas guanenta* sp. nov. Male holotype (ICN-Ao-742.1) habitus in dorsal (**A**) and lateral (**B**) views; coxa I, ventral view (**C**); chelicera, frontal view (**D**); right pedipalp, mesal view (**E**). Male paratype (ICN-Ao-742): genitalia in lateral and ventral views (**F**); detail of stylus (**G**). The colored letters A-D refers to the chaetotaxy system of Kury and Villarreal (2015). Abbreviations: DH—dorsal hump, DP—dorsal process, LP—lamina parva, Ma—malleus, St—stylus, T—truncus. Scale bars: 0.5 mm (**A-E**); 0.05 mm (**F,G**).

(Figs 1D, E, 2B). Posterior margin of DS substraight, with a row of tubercles. Free tergites I–III with a row of tubercles and anal operculum with some tubercles (Figs 1B, 2A, B). ***Venter*:** Tegument granular. Coxa I with one trifid tubercle on the anterior margin and a transverse row of tubercles on the medial region (Fig. 2C). Coxa III-IV with some tubercles. Sternites with rows of spaced granules (Fig. 1C, D). Stigmatic area slightly granular. Stigmata large and oval (Fig. 1C). Genital operculum slightly granular. ***Chelicerae*:** Chelicera swollen. Segment I rectangular in dorsal view, with three-four tubercles on the proximal region and one-two tubercles on the ectal face (Figs 1B, 2A). Basal region of the movable finger with abundant setiferous tubercles of different sizes (some reaching the medial region of hand) (Fig. 2D). Fixed finger with smooth inner surface (Fig. 2D). Movable finger with one trapezoid sub-basal tooth and distal inner surface dentate (Fig. 2D). ***Pedipalps*:** Trochanter with five dorso-basal tubercles and two ventroectal tubercles. Fe with a ventroectal row of four setiferous tubercles (the two basalmost largest and the two distalmost small-sized), and one large ventromesal setiferous tubercle in the distal portion. Pa armed with one large ventromesal setiferous tubercle (Fig. 2E). Tibial setation:

ectal iiIi, mesal IIi. Ta setation: ectal I?i, mesal IIi. ***Legs*:** Leg I–IV granular. Leg I filiform, the rest getting steadily thicker from leg II-IV (Fig. 1A). Tr I-III slightly granular, Tr IV with two dorsodistal tubercles (Figs 1B, 2A). Tarsal counts: 7(3)-7(3)/17(3)-16(3)/7-7/8-7. ***Penis*:** LP small and depressed, crescent-shaped, with anterolateral short sharp corners, apically pointed (Fig. 2F). Malleus with two pairs of trifid MS-A, and one pair of trifid MS-B (Fig. 2F); MS-C absent. Two pairs of MS-D located in a keel between the ventral part of LP and the base of the stylus; MS-E2 large and trifid, MS-E1 medium-sized (half of the size of MS-E2) (Fig. 2F). Stylus straight and elongated, surpassing the LP, with a short DP at the proximal region, and a DH just after the union of the DP with the stylus (Fig. 2G, F). ***Color* (in ethanol)** (Fig. 1A–E): Carapace and mesotergum reticulated Dark Grayish Olive (111) on Light Grayish Olive (109). Pedipalps and chelicerae Yellowish White (92). Free tergites Dark Olive (108). Coxae I-IV Light Grayish Olive (109) with lateral margins Dark Olive (108), trochanters I-IV Light Grayish Olive (109). Fe, Pa, and Ti I Dark Olive (108). Femora and tibiae II-IV Light Grayish Olive (109), patellae II-IV Dark Olive (109).

Female paratype (ICN-Ao-742). Similar to male, except for the non-hipertelic chelicera and shorter Fe IV. Measurements (mm): CL (0.57), AL (0.93), CW (1.06), AW (1.24), DSL (1.50), IOD (0.23), ChL (0.61). Pedipalp: Tr (0.22), Fe (0.49), Pa (0.32), Ti (0.46), Ta (0.43), Claw (0.33). Legs (Tr/Fe/Pa/Ti/Mt/Ta/TL): I (0.26/2.00/0.42/1.52/2.96/1.05/8.21), II (0.34/4.87/0.50/4.54/6.08/3.69/20.02), III (0.31/3.70/0.64/2.21/4.02/1.16/12.04), IV (0.34/5.52/0.65/?/?/?/?). Tarsal counts: 7-7/17-?/7-?/?-?.

Distribution. Known only from the type locality, a cave in the Magdalena Valley montane forest ecoregion (NT0136) (Fig. 4).

Barinas virginis (González-Sponga, 1987) comb. nov.

Figs 3, 4

Vimina virginis González-Sponga 1987: 547, figs 714–719; Kury 2003: 34.

Type data. Venezuela• ♂ holotype: Trujillo, Trujillo, Cerro de La Virgen, environs of Trujillo; [9.349513, -70.457898]; 1100 m; A.R. Delgado de González, J.A. González Delgado y M.A. González-Sponga leg.; MCNC 981 • 1 ♀ paratype; same data as holotype; MCNC 982 • 1 ♂ paratype; same data as holotype; MAGS.

Other examined material. Venezuela• 3 ex.: Trujillo, Cerro La Virgen; 1100 m; 28 July 2006; O. Villarreal leg.; MNRJ 9324* • 1 ♂; Trujillo, Cerro de La Virgen; 1300 m; MAGS 852.

Complementary description. DS Epsilon type 2 (Fig. 3A). Anterior and lateral margins of DS smooth, posterior margin with some granules. Ocularium low, with median concavity, unarmed (Fig. 3B). Mesotergum delimited, divided into four areas, granulate; area I divided longitudinally, areas II–IV undivided; AHF: II = I<III = IV (Figs 3B–E). Posterior margin of DS substraight. Free tergites I–III with granules (Fig. 3E). Cheliceral hand swollen. Legs increasing in thickness from leg I to leg IV, unarmed, leg I filiform. Fe IV two times DS length (Fig. 3B). Penis with small LP (height less than width), apex with anterolateral sharp corners. Malleus with two pairs of branched MS-A; one pair of branched MS-B; MS-C absent; MS-D absent (see remarks); MS-E2 large and trifid, MS-E1 absent. Stylus elongated, curved at distal third, surpassing the lamina parva, with dorsal process and dorsal connective tissue (Fig. 3F).

Remarks. It seems that MS-D and MS-E1 went unnoticed or ignored in some works of González-Sponga (1981, 1987, 1998). However, *Barinas* species has these MS, as explained by Ahumada-C. et al. (2020). Therefore, we suspect that they are present in *B. virginis* comb. nov. as well, but only a revision of the male genitalia could settle this issue.

Barinas piragua Ahumada-C. & García, 2020

Barinas piragua: Ahumada-C. et al. 2020: 635.

Previous records. Colombia: Bolívar and Magdalena departments.

New records. Colombia• 2 ♀: La Guajira, Hatonuevo, Cerro Bañaderos, 11°7’33.3"N, 72°47’06.9"W [11.125899, –72.785241]; 785 m; 19 May 2018; Miguel Gutiérrez leg.; CBUDC-ARA 346.

Discussion

The penis of the *Barinas* species shows remarkable characters, as the short size of the corners of the LP and the shape of the stylus. For the first case, the genus has a LP with very short corners that do not exceed the insertion point of the MS-A2 (just known in *Paravima* Caporiacco, 1951 as far as we know). On the other hand, the distal half of the stylus exhibits a 45-degree curvature at the dorsal region (except *B. guanenta* sp. nov) not present in the other Leiostheninae genera. Nevertheless, the presence of paired armature in all the mesotergal areas plus the basal DP on the stylus is a combination of characters exclusive of *Barinas*, so, we do no doubt about the inclusion of *B. guanenta* sp. nov. in it.

Additionally, we noted that *B. flava* lacks additional ornamentations above the insertion point of the DP (see Ahumada-C. et al. 2020, fig. 1F), while the other species of *Barinas* exhibits both a DH (see Ahumada-C. et al. 2020, fig. 4D for *B. piragua* and Fig. 2G for *B. guanenta* sp. nov.) or connective tissue in *B. virginis* comb. nov. (Fig. 3F). Nonetheless, it is difficult to know if the DH is the remnant of membranous tissue or corresponds to another structure. We think that SEM images of the genital of *B. flava* could help to better understand such an issue and that a phylogenetic

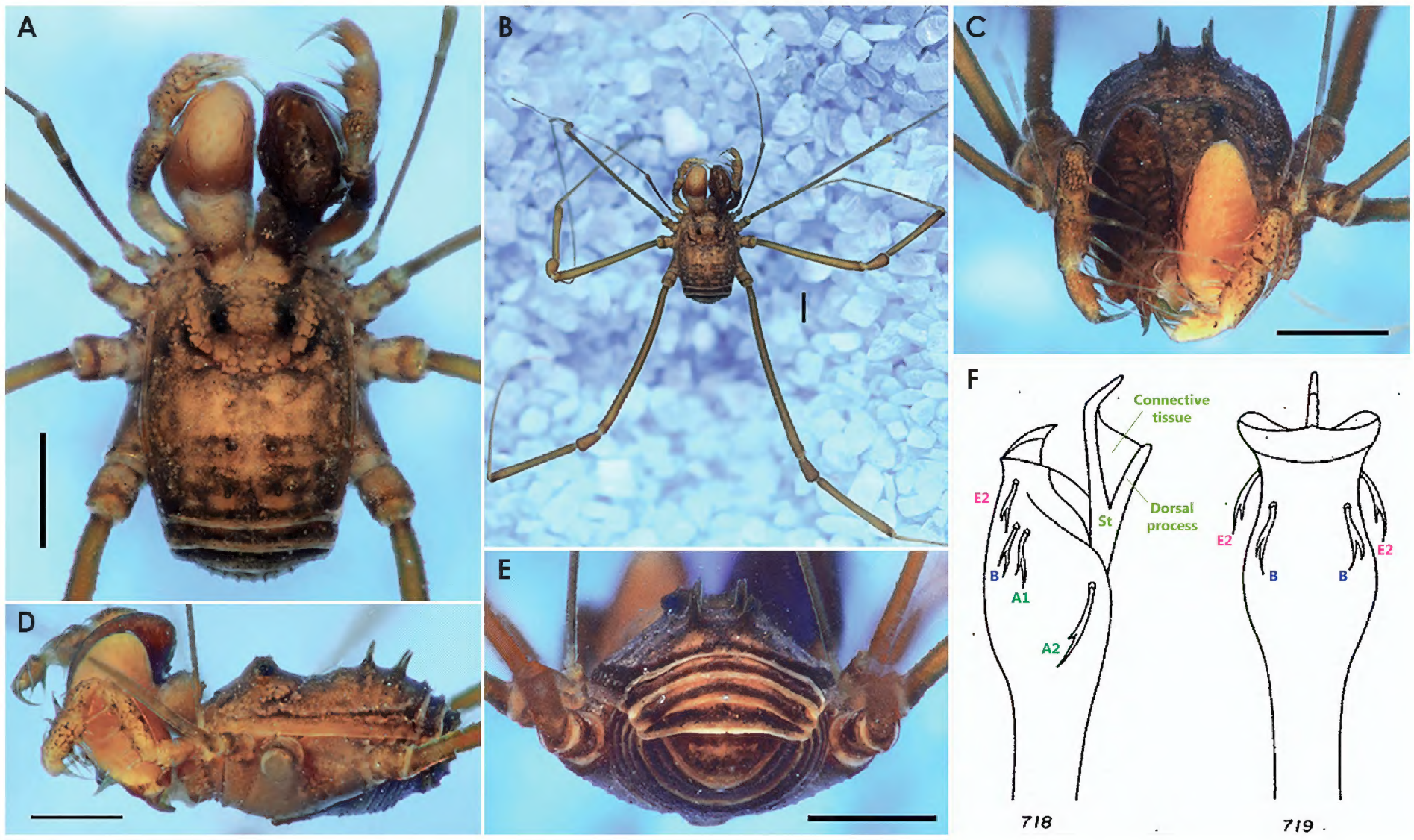

Figure 3. *Barinas virginis* (González-Sponga, 1987) comb. nov. (MAGS 852), male. Habitus in dorsal (**A**), panoramic (**B**), frontal (**C**), lateral (**D**), and posterior (**E**) views. Penis drawings (**F**) of holotype (MCNC 981) (González-Sponga, 1987: 550, figs 718–719), lateral and ventral views (modified to show the chaetotaxy system of Kury and Villarreal (2015)). Scale bars: 1 mm. Photos courtesy of Osvaldo Villarreal.

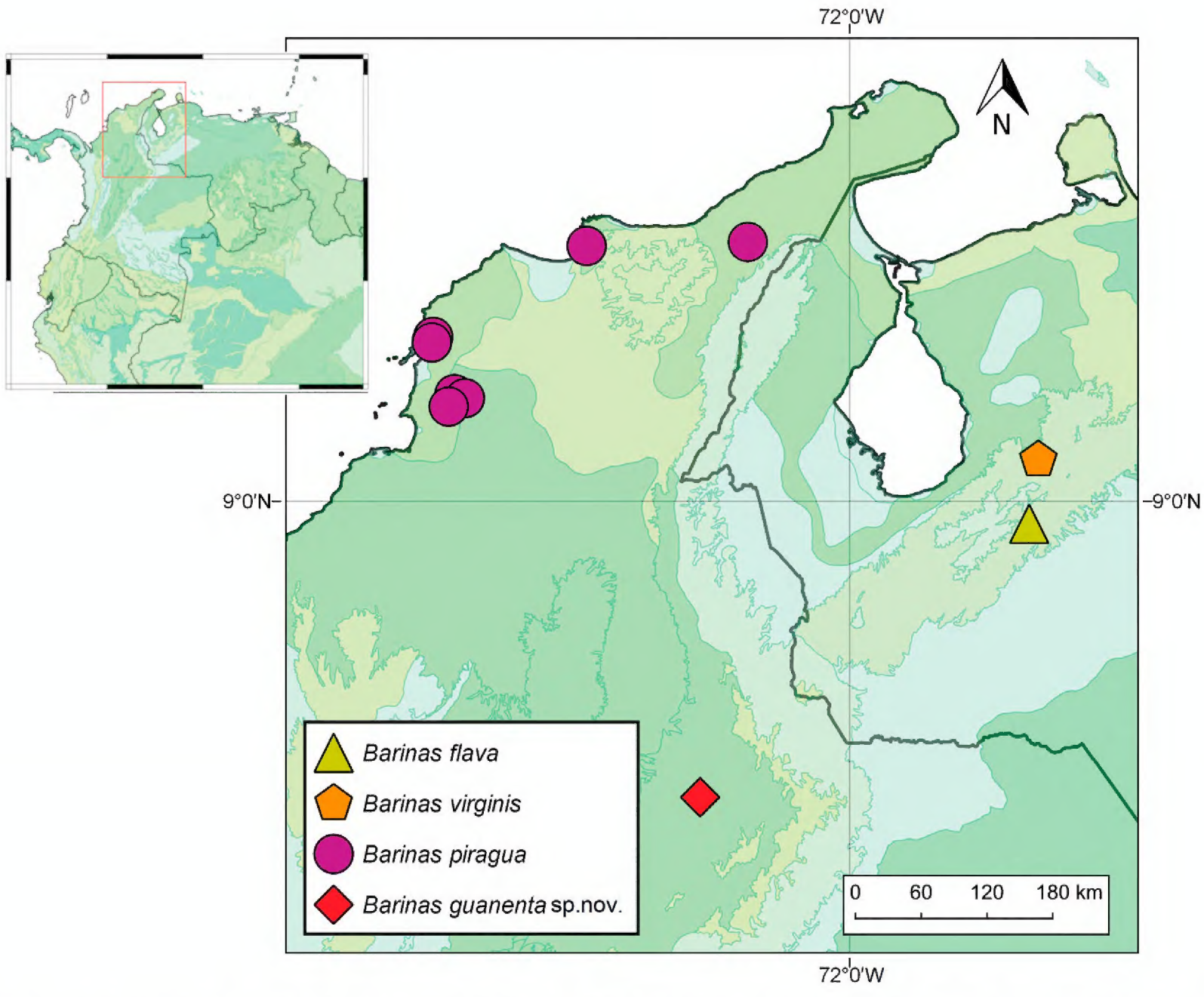

Figure 4. Map showing the distribution of *Barinas* in Northern South America. Colored shapes refer to WWF Terrestrial Eco-regions of the World (Olson et al. 2001).

analysis including all the species of *Barinas* and more representatives of Leiosteninae could help in the understanding of the internal relationships of the group.

Finally, we would like to reinforce the importance to do scientific expeditions in the cave systems in Colombia, mainly because those have perfect conditions of humidity and darkness for the harvestmen. Besides *B. guanenta*, there are three oficial records of the order Opiliones in caves: *Andrescava sturmi* Roewer, 1963 (Agoristenidae) in National Natural Park Cueva de los Gúacharos (Huila); *Phareus antrophilus* Villarreal & Rodríguez, 2006 (Stygnidae), in Gámbita (Santander); and *Phalangodus briareos* Villarreal & García, 2016 (Cranaidae), from Zapatoca (Santander) (Barriga et al. 2019). However, there are many undescribed species and genera, as evidenced by some recent works on the cave systems of Santander (Casallas-Pabón et al. 2013; Barriga et al. 2019).

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